

## CLAIMS

What is claimed is:

5      1. A method for modeling a behavior of an electrical circuit, comprising:  
          forming a trained neural network which models the behavior of the  
          electrical circuit.

10     2. A method as in claim 1, comprising:  
          statistically covering an entire space for the behavior of the electrical  
          circuit.

15     3. A method as in claim 2, wherein fully enumerating coverage of the entire  
          space would require more than a predetermined computation time.

20     4. A method as in claim 3, wherein the predetermined computation time is one  
          week.

25     5. A method as in claim 1, wherein the behavior of the electrical circuit  
          comprises power consumption of the electrical circuit.

          6. A method as in claim 5, wherein the power consumption of the electrical  
          circuit comprises leakage power of the electrical circuit and switching energy of  
          the electrical circuit.

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7. A method as in claim 1, comprising:

using the trained neural network to form a profile of current versus time for the electrical circuit.

5 8. A method as in claim 1, further comprising:

using the trained neural network to provide input data to a second neural network to form a second trained neural network, wherein the second trained neural network models the behavior of a second circuit, and wherein the second circuit comprises the electrical circuit and other circuitry.

10 9. A method as in claim 1, wherein the step of forming the trained neural network comprises:

15 using a non-neural network model of the electrical circuit to generate input data for neural network training.

10. A method as in claim 9, wherein the step of forming the trained neural network further comprises:

15 using the input data to train a neural network to produce the trained neural network.

20 11. A method as in claim 9, further comprising:

25 using the input data to train a second neural network.

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12. A method for fully modeling a behavior of at least a portion of an electrical circuit, comprising:

selectively modeling the behavior of a portion of the electrical circuit in order to generate a first plurality of cluster values for the behavior of the portion of the electrical circuit;

5 training a first neural network to form a first trained neural network;

generating a first plurality of cluster probabilities using the first trained neural network; and

using the first plurality of cluster probabilities and the first plurality of 10 cluster values, fully modeling the behavior of the portion of the electrical circuit.

13. A method as in claim 12, wherein the behavior comprises power consumption.

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14. A method as in claim 13, wherein the power consumption comprises leakage power and switching energy.

15. A method as in claim 12, further comprising:

20 using the trained neural network to form a profile of current versus time for the portion of the electrical circuit.

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16. A method as in claim 12, further comprising:

selectively modeling the behavior of the portion of the electrical circuit to produce input data for a higher level of modeling;

using the input data to generate a second plurality of cluster values for the behavior of the electrical circuit;

5 training a second neural network to form a second trained neural network;

generating a second plurality of cluster probabilities using the second neural network; and

using the second plurality of cluster probabilities and the second plurality of cluster values, fully modeling the behavior of the electrical circuit.

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17. A method as in claim 12, further comprising:

performing feature extraction on inputs to the first neural network and on inputs to the first trained neural network.

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18. A method for modeling power consumption behavior of an electrical circuit, comprising:

generating a plurality of cluster power values for the electrical circuit;

training a neural network to form a trained neural network;

20 generating a plurality of cluster probabilities using the trained neural network; and

using the plurality of cluster probabilities and the plurality of cluster values, modeling the behavior of the electrical circuit.

19. A method as in claim 18, wherein the power consumption behavior of the electrical circuit comprises a leakage power component and a switching energy component.

5    20. A method as in claim 18, comprising:  
      using the trained neural network to form a profile of current versus time for  
      the electrical circuit.

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